PUBLIC HEALTH REPORTS.

New plan of campaign against yellow fever.

By Dr. E. LICEAGA,
President of the Superior Board of Health of Mexico.

(See Public Health Reports of February 12, 1904, pages 221–227, "Measures recommended for adoption by the United States and Mexico for the prevention of yellow fever.")

The Department of the Interior has been pleased to approve of the following initiative of the president of the supreme board of health for continuing the campaign against yellow fever:

It would appear that the series of communications which I have presented to your Department on behalf of the board of health, with the idea of attempting to combat the epidemics of yellow fever, would have carried conviction to all minds; but, nevertheless, experience has shown me that this has not taken place, and that it is necessary to demonstrate still more clearly the teachings of science and the results of experience gained in foreign countries as well as in our own. I thus find myself under the necessity of again presenting to the consideration of my countrymen the present condition of this question.

If we consider it from the humanitarian point of view, the loss of life ought to impose on us the obligation of suppressing a disease that every year causes numerous victims in persons of all ages and conditions, but more especially in those that have reached middle age. Another consideration is that of economy. If every man has a certain value for the State, the loss of lives withdraws laborers from agriculture, industry, and commerce, and this loss directly influences to the injury of public wealth, and even the disease in itself, besides the suffering that it occasions, temporarily withdraws the man from the work by which he gains his living and at the same time contributes to the public wealth.

The development of our ports has suffered serious delay, as is proved by the history of Tampico. During the twenty years, from 1878 to 1898, during which no yellow fever was found, its progress was very rapid, so much so that it was expected it would become a powerful rival to Vera Cruz, when the epidemic of 1898 appeared to delay the rapidity of the progress that had commenced.

The reappearance of yellow fever in the month of May of this year led to the emigration of so many people that laborers became very scarce for the port business, for the industry of the town, and even for attending to the necessary provisioning of those who remained. The port of Progreso, which on account of its situation near the island of Cuba and its close relations with this island and the United States

ought to have reached a high degree of prosperity, finds that prosperity detained through the fear of yellow fever. The port of Veracruz has been unable to advance or to reach the degree of prosperity which it had a right to expect in view of its commercial importance, a position with respect to the rest of the country and the facilities which its harbor works afford to trade, because it is the principal focus of the endemia of this disease.

The terror that is inspired by the epidemics of yellow fever keeps thousands of foreigners from the coast lines along the Gulf, who would be willing to go there and elevate the agriculture of those regions to the height which it has reached in similar districts. As I have already stated, the harbor works which were intended to furnish shelter for the ships and allow them to moor alongside of the wharves have remained practically useless, since the United States and the Island of Cuba declare that the ships which lie alongside the wharves are infected, whilst those which remain out in the bay are immune. What is the use of having undertaken the enormous expenses to make Vera Cruz a good port if the nations which have the most frequent and important relations with that port require their vessels to remain at anchor out in the bay, so as to avoid being submitted to strict quarantine such as is imposed in Habana?

I might extend myself very much further in considerations of this character, but those which I have already pointed out are sufficient to show the injuries that our agriculture, industry, and foreign commerce suffer through the existence of yellow fever, and the constant humiliation that is put upon us by neighboring nations, which, formerly tolerant, when their conditions were similar to ours, are now very exacting when they have amended their own conditions.

If the efforts made by the scientific congresses, if the resolutions of the sanitary conventions have been unable to liberate us from the hard treatment which is given to our commercial ports, we have only one way of liberating ourselves from this tyranny, and that is to exterminate yellow fever from our soil.

But is this possible? It certainly is, and to demonstrate that fact we will enter into considerations of a strictly technical character.

DOCTRINE OF THE TRANSMISSION OF YELLOW FEVER.

Doctor Finlay, a distinguished physician of Habana, was the first to suspect that yellow fever could be transmitted by the bite of a mosquito which was supposed to be the *Culex fasciatus*, but this idea was not taken into consideration at the time when he made his first studies on the subject, and it was necessary for the military intervention of the United States to be established in the island of Cuba for that powerful nation to understand that without the extermination of the disease that had exhausted the Spanish army and killed off the enormous number of immigrants of that nation, the military occupation of the island could not be made effective. With this idea it put all its scientific men to work, and after a series of experiments that will be always remembered in the history of humanity, these men were able to prove in the most conclusive manner that all the ideas up to that time held as to the etiology of yellow fever were inexact. These studies have been confirmed in other places; they have been ratified in our own port of Vera Cruz by an American commission which carried out

its labors during last year and that have now been sanctioned by the Pasteur Institute, whose members have a world-wide reputation.

This doctrine can be expressed in a very few words: When a yellow fever patient is stung by the *Stegomyia fasciata* mosquito, this insect becomes infected within a period of not less than twelve days, and once it is infected it is capable of transmitting the disease to a healthy individual who is not immune within a period of not less than five days, and that in exceptional cases may reach six days. From this knowledge we find that there are three indispensable factors in the appearance of yellow fever: Firstly, a person suffering from that disease; secondly, a mosquito of the genus *Stegomyia fasciata*, which will transmit the disease; and, thirdly, healthy persons who do not enjoy immunity and can be inoculated with the disease.

The natural history of the mosquito in question has been the object of profound studies on the part of American and Cuban physicians, and from this study we have acquired the following data: First, that the *Stegomyia fasciata* mosquito deposits its eggs in clean water; second, that, when transformed into larvæ, these require to rise to the surface of the water every minute in order to breathe the atmospheric air; third, that the duration of the life of these infected insects may last up to one hundred and fifty-four days; fourth, that these insects are continually found in human habitations; fifth, that during the winter they preserve their fatal property of infection, and that when the summer comes back they are again capable of infecting individuals who are not immune.

At the same time that the above knowledge has been obtained, we have also reached the conviction that the measures which are really adapted for the transmission of the disease have not as yet been fully demonstrated.

PROPHYLACTIC MEASURES IN VIEW OF THE TRANSMISSION OF YELLOW FEVER BY THE MOSQUITO.

The precautions that were formerly taken to ward off yellow fever, the greater part of which were of an empirical character, have been substituted by others, which are based on the positive information I have above mentioned. In fact, it is no longer necessary to think that the origin of the disease is found in the soil or in the air, and in certain parts of the ships, in the clothing that is stained by the dejecta, or in contact with the patients. Consequently, we must not proceed as formerly. The prophylactic measures of the present date consist in the separation of the three principal elements above referred to; the yellow fever patient, the mosquito that, by sucking his blood, infects itself and thus becomes capable of transmitting the disease, and the nonimmune, who is in a condition to receive it. As it would be humanly impossible to separate all the healthy persons who are capable of contracting the disease, sanitary science confines its efforts to the two first elements.

In order that a man suffering from yellow fever may no longer be dangerous, it is necessary to isolate him, but not in the same manner as persons are isolated who suffer from other diseases. The isolation in this case is for the purpose of preventing his being stung by mosquitoes, and this condition is easily realized by covering all the windows with fine wire netting, that will prevent the entrance of the insect, and by

placing double doors with wire netting at the entrance of the room in which the patient is isolated, so arranged that when the outer door is opened, the inner one is necessarily closed and can only be opened when the outer door is closed. A chain of a fixed length will permit this idea to be carried out. A room under these conditions is that which ought to be dedicated to the isolation of yellow-fever patients. Any other method that does not render it impossible for the mosquito to come into contact with the patient is entirely useless and should be abandoned. It is therefore sufficient to prevent the development of yellow fever in any place as an epidemic for the first patient to be isolated as soon as he reaches the locality, because it is necessary to understand that experimental science has proved that from the first to the fourth day of the disease is when the persons suffering from yellow fever most certainly infect the *Stegomyia fasciata* mosquito. In this way we come to the other rule, that an individual ought to be isolated from the moment that he presents any feverish symptoms, whatever may be the disease that produces them.

If, therefore, we can count on a place dedicated to suspected patients, (and they all are when they have fever) such patients can not infect the mosquito, and the further course of the disease shows whether the suspected person is or is not suffering from yellow fever. If he is, he is at once passed into the special ward, which is arranged as above stated, in order that he may be there isolated until his sickness terminates. His contact with the other suspected persons in whose company he has been, has presented no danger for them, seeing that they were all in a room into which the mosquitoes could not penetrate; these insects could not carry the disease to them.

It is also indispensable to destroy the mosquitoes that have been infected, and for this purpose we do not employ the methods of disinfection that are commonly used for transmissible diseases. In this case the objects of the disinfection are clearly defined, and simply consist in the destruction of the mosquito. The three methods that generally recommend themselves are the following: The damp vapors of sulphurous acid, and the combustion of chrysantema and tobacco. In order to employ these methods it is indispensably necessary to close the doors and windows and paste paper over all openings of any kind, however small they may be, that communicate with the outside air; that a sufficient quantity of chrysantema, sulphur, or tobacco be burnt, and the room kept closed for the necessary period, after which the doors are cautiously opened and the dead or sick mosquitoes collected; and to avoid the chance of any of them surviving, they should be incinerated. Of the three substances above indicated sulphurous acid is the only true insecticide, and the only one which we recommend. Later on we will give the proportions in which the material is to be burnt, in relation to the capacity of the room which it is desired to disinfect.

But it is not enough to make war on the mosquitoes that have already been infected; it is necessary to undertake their extermination in their native habitat, and for this purpose we utilize the information given to us by natural history, that the mosquitoes of the genus *Stegomyia fasciata* deposit their eggs only in clean water. This water is found in the dwellings, in reservoirs of more or less capacity, and also forms ponds on the surface of the ground. In order to prevent the insects from depositing their eggs in those recep-

tacles of clean water, it is only necessary to cover them with fine wire netting, such as that which is employed to cover the doors and windows of the rooms in which patients are isolated. If the water reservoirs are of large size, or through any circumstance can not be covered, a thin layer of petroleum in a crude state is spread over them. This acts in two ways: As a mechanical preventive against the laying of the eggs in the water and as a destroyer of the larvæ, as shown to us by the natural history of these insects, that these larvæ require to come to the surface every minute in order to breathe the air. The layer of crude oil mechanically prevents this rising to the surface and the larvæ die of asphyxia.

Here we have the practical methods that will prevent the development and propagation of yellow fever.

METHODS FOR UTILIZING THE RESOURCES OF SANITARY SCIENCE FOR PREVENTING THE SPREAD OF THE DISEASE IN ANY TOWN.

In the case of yellow fever hygiene pursues three objects: The isolation of the patient, the destruction of the infected mosquito, and the prevention of the development of fresh mosquitoes of the genus above mentioned.

ISOLATION OF THE PATIENTS.

In order for the isolation to be efficacious it must commence from the moment that the disease appears, and the resources on which we can count for knowing that a patient is suspected of having yellow fever are the following:

First. The obligation, which lies on all physicians under the sanitary code of the United Mexican States, of notifying the sanitary authorities of all patients who are suspected of having yellow fever.

Second. The obligation, which is also legal on all heads of families, chiefs of workshops, colleges, schools, barracks, etc., to give the same notice.

But as it might happen that the above-named persons should neglect the fulfillment of their duty and not make the declaration which is required by law, and that through this omission a yellow fever patient might be exposed to the sting of the mosquitoes, strict and continued domiciliary visits have been provided for. The experience that has been acquired in Habana, and that which we have had in Mexico during the epidemic of bubonic plague that prevailed in Mazatlan, have shown that any patient can be discovered from the moment that he commences to have fever, always provided that a sanitary corps is organized under the direction of persons who are properly instructed in the way to carry out these investigations. Some members of the sanitary police have reached a high grade of perfection in the fulfillment of this task, and they will be able to give instruction in the different localities that are liable to an invasion by the disease.

The declaration of the case, or its discovery by the domiciliary visit, should be followed by the immediate isolation of the patient in the suspected department. By acting in this manner the mosquitoes would have no time or opportunity to sting the patient. But to avoid even the possibility of such a thing happening in any place that is threatened with an epidemic, all the nonimmunes should be recommended to keep themselves covered at night by mosquito nettings, and informed

of the dangers to which they are exposed if they do not observe this simple recommendation.

As isolation is the fundamental basis of the struggle against an epidemic, it is necessary to make a careful study of the way in which it is to be carried out. If all the inhabitants of a town were educated and sufficiently cultured to properly understand the doctrine of the transmission of yellow fever, the general recommendations above given would be sufficient for each family to undertake the isolation of its patient, and to do so conscientiously, shutting him up in a room whose doors and windows would be provided with wire netting, and that would carefully and absolutely prevent the intrusion of any mosquito that could sting the patient; but, unfortunately, this special education is not to be found in the great majority of cases, and it becomes indispensably necessary for the public authorities to intervene in order to take the place of this want of special education.

The way in which the methodical and efficacious isolation is carried out in the hospitals under the direction of an intelligent medical staff that thoroughly understands its mission and that is anxious to comply with its duty, as well as assisted by subordinate employees who are thoroughly penetrated with the same ideas, is what ought to serve as an example or objective lesson to the general public. Besides the advantages above indicated, isolation in the hospital facilitates the administration of the medicine, the distribution of the meals at the hours prescribed by the physician, and it is a case in which discipline governs and is also of economical results for the public administration, because experience has shown the difficulties of attending the patients at their homes and the increased expenses that it imposes on the public funds.

At the same time, as there are persons of culture and means who can pay for their attendance in some place where a collective isolation is carried on, special hospitals will be established in which patients of this class will be isolated, and only under special and exceptional circumstances, and with the consent of the sanitary authorities, will any patient be allowed to be isolated in his own home. This individual or collective isolation is an obligation imposed on all citizens by the federal sanitary code, so that no person, whatever may be his age, sex, social condition, or nationality, can escape this obligation; and if at any time we have a full justification of the axiom that the public health is the supreme law, it is when it is a case of saving the community from the injury that an individual might cause it, by not freely submitting to the provisions in force.

In one word, the isolation of patients in the case of epidemics such as yellow fever is absolutely obligatory.

If we proceed to this isolation with promptness and vigor, we can absolutely make certain that a yellow-fever epidemic will be unable to spread in any locality.

DESTRUCTION OF INFECTED MOSQUITOES.

As above stated, this operation is carried out by hermetically closing the room in which a patient has been who could have been stung, covering all the cracks in the doors and other parts by pasting paper thereon and burning sulphur in the proportion of 40 grams per cubic meter of space in the room, arranging one or more vessels which con-

tain burning coals in a perfect state of combustion, so that when sulphur is thrown on them sulphurous acid is produced in such quantity as to saturate the atmosphere of the room.

After a lapse of at least four hours the room is opened, and once the atmosphere is rendered fit for breathing, all the mosquitoes which have fallen to the floor will be swept up and immediately incinerated. This operation, which is in itself very simple, nevertheless requires to be carried out by persons who are accustomed to its execution, and for this reason it will be necessary to organize a disinfecting corps under the orders of an experienced chief, who will carry out this operation in every house in which there has been a yellow fever patient.

DESTRUCTION OF THE LARVÆ OF THE STEGOMYIA FASCIATA.

From the teachings of natural history, as above mentioned, it is necessary to commence by emptying the reservoirs of clean water in which the larvæ of these insects have developed; rubbing the inside of the vessels so that no live larvæ will remain; pouring clean water into them and covering them with a close-fitting cover or a close wire netting, the object of which will be to prevent the mosquitoes from depositing their eggs in such vessels; but the water reservoirs of a larger size, such as ponds, tanks, etc., and the small ones that may accidentally appear after the rain, and even the small hollows that are left in the ground by passing animals, should be covered with a thin layer of crude petroleum.

As before stated, the object of this is to prevent the insects from laying their eggs in the water, and in those places in which the eggs are already laid, to prevent the larvæ from rising to the surface in order to breathe the air. In order to carry out this operation, it becomes necessary to form a third corps which will visit from house to house in order to investigate the condition of the water reservoirs, empty out those which already contain larvæ, clean them perfectly, fill them up with clean water, and cover them with a closed cover or metallic net, and spread petroleum in the proportion of 30 grams per square meter of surface on the other water reservoirs above mentioned. In those places where water may be thrown out that contains larvæ, it will be necessary to take the precaution of spreading petroleum in order to prevent their development. Although these operations are very simple, they require to be carried out by persons who are accustomed to execute them perfectly, and hence comes the necessity of forming the third corps, which will be exclusively dedicated to this object.

I have above given the method that should be put in practice for preventing the development and spread of an epidemic in any locality that is already invaded or in which the epidemic is commencing.

MEASURES INTENDED TO PREVENT THE SPREAD OF THE DISEASE FROM AN INFECTED TO A HEALTHFUL LOCALITY.

Men, like animals, always show a tendency to emigrate as soon as they discover the possibilities of contracting a disease. This emigration ought not to be prevented, because it diminishes the number of persons in the locality who run the risk of an attack, but on the condition that no suspected or sick person who could carry the epidemic

to a fresh locality be allowed to leave. In order to prevent this, a committee of physicians is organized to examine all persons who attempt to leave the town.

In order that this examination may be complete, besides the other means of investigation employed by the physician, he should add the use of the thermometer, as any person who may be found in a feverish condition not only ought not to be allowed to depart, but he ought also to be isolated in the suspected department. Should the investigation show that the person who desires to depart is not sick, he will be granted a passport that will state his name, age, sex, profession, or occupation, and also that he is in good health and not suffering from any feverish symptoms, the hour at which the inspection was made, and his destination. The medical committee will keep a register showing all these data and will duly advise the political and sanitary authorities, if there are any, of the place to which the passenger is traveling.

The person traveling under passport will be bound to present it in the sanitary stations through which he may pass and at the termination of his journey, so that he may be under surveillance for five days.

As can be seen, the object of this measure is to prevent any sick or suspected person from leaving his town and at the same time to keep a watch over the passengers who could carry with them the germs of the disease either on the road or to their place of destination. In order to make these precautions successful, it will be necessary to apply them to all who travel by railroad, carriage, on horseback, or on foot, and to be inflexible in the punishment of all who contravene these regulations.

In order to prevent the infected mosquito from finding a lodging in railroad or ordinary coaches, or in any other kind of vehicle, these will be disinfected by means of sulphurous acid before they are allowed to depart, and this disinfection will be continued in every sanitary station. The disinfection of the box cars and goods is only for the purpose of destroying the mosquitoes that may have lodged on the walls of the cars or on the covers of the goods, and can be carried out without opening the cars by introducing, through an aperture opened in one of the sides or through a small door, sulphurous-acid vapor that is generated outside in a special apparatus and carried into the inside by means of a hose or metallic tube. When it is a question of disinfecting cars that contain delicate tissues, metallic objects, etc., that could suffer deterioration through the action of sulphurous acid, it will be necessary to employ hydrocyanic acid, which is a powerful insecticide, the operators strictly complying with the rules of the special instructions that have been formulated by the board, so as to avoid the accidents that might take place through the imprudent handling of this dangerous substance.

The railroad traffic, which appears to facilitate the transmission of disease, would not be so if the rules above given are established; and further security can be obtained if the passengers are transshipped to other coaches before entering cities that are immune, if sanitary stations are established as ordered by the sanitary code, for the purpose of exercising a vigilance over the passengers, and the disinfection operations are repeated in the coaches and box cars that carry the baggage or merchandise. It is necessary not to forget that these operations, as regards yellow fever, have no further object than that

of destroying the infected mosquitoes, and consequently the operation is reduced to its most simple form.

The sanitary stations, which as already stated are intended to exercise a vigilance over the passengers who travel by railroad, coach, on horseback, or on foot, and the detention therein of the passengers who are either sick or suspected of being so, are sufficiently efficient when well established. The results that were obtained by this means in the State of Sinaloa when the port of Mazatlan and neighboring villages were invaded by the bubonic plague have convinced us of their utility, with the sole condition that the staff employed in these stations will be composed of upright physicians who are thoroughly penetrated with the duties of their office and have the assistance of an expert staff.

In order that all these measures may obtain the desired results, it is indispensable that their action should be efficacious and timely; that they shall be under the orders of only one authority and executed by a properly instructed staff who is zealous in the performance of its duty.

The example given to us by what happened in Mazatlan is a teaching which we must not forget. Through the supreme board of health, the Executive of the Union studied, the measures which ought to be adopted, and once a plan was formed, its execution was intrusted to that board, under the vigilance of the Department of the Interior.

The governor of the State of Sinaloa, whose conduct will always be worthy of the highest praise, constituted himself the intelligent and self-denying instrument to carry out the orders of the federation, and, following his example, the whole of the State and municipal authorities, the charitable board, and private individuals, formed a perfectly organized corps under the direction of physicians, who gave the admirable example of exterminating a disease that was so much feared as the bubonic plague within a period of only six months. The results obtained lead the board to hope that if your department will address itself to the governments of those States in which yellow fever prevails, propose to them the adoption of the plan of defense against this disease, as above sketched, and request their consent to carry it out under the same conditions as those that prevailed in the State of Sinaloa during the campaign against the bubonic plague, the same successful results will be obtained as in the other case.

The board has full confidence that the interested states will accept the proposal made to them by the Executive, because that of Veracruz has for the past year appropriated a sum to the struggle against yellow fever, and in the present year has requested the federal government to confide to the board the direction of the campaign against that disease, while the state of Tamaulipas has followed that example and also solicited the intervention of the board. The state of Yucatan, which has undertaken such a vigorous campaign against that disease, and that feels the advantages derived by its interior and foreign trade as soon as its soil is cleared of yellow fever, will undoubtedly accept the initiative of the Executive of the Union.

The States of Campeche, Tabasco, Chiapas, Oaxaca, Nueva Leon, and San Luis Potosi, in which yellow fever is not endemic, but into whose territory it spreads whenever it takes an epidemic form, will, I believe, not hesitate to take part in this convention, seeing how inter-

ested they are in not permitting that disease to disturb their communications or the progress into which their people have lately entered. The board trusts that none of the above-mentioned States will resist the conviction that, even if their isolated efforts could be sufficient to stamp out the disease in any particular locality, they would be incapable of stamping it out from our territory, unless the direction of the campaign is entirely handed over to the federal district. And lastly, the board feels certain of counting on the cooperation of the whole of the States in this undertaking, because it is work that is at the same time necessary to the welfare of humanity, to civilization, and to the moral and material progress of Mexico.

MEXICO, *November 13, 1903.*

Protection of fever patients against mosquitoes.

Resolution adopted by the Louisiana State board of health, March 1, 1904.

NEW ORLEANS, LA., *March 3, 1904.*

To the physicians of Louisiana.

GENTLEMEN: In compliance with instructions from the Louisiana State Board of Health I have the honor to transmit for your information the following copy of resolutions adopted at the regular meeting, held March 1, 1904:

Whereas it has been proven that malarial fever and yellow fever are transmitted by mosquitoes, and that other fevers may possibly be transmitted by them, be it

Resolved, That the Louisiana State board of health most emphatically urges all physicians and all persons attending patients with fever to carefully keep a well-tucked bar over such patients, especially during the first four days of their illness, and as far as practicable to destroy mosquitoes about the patient's bed and room.

This precaution should be particularly observed from April 1 to November 30.

Resolved further, That a copy of these resolutions be sent to all the health officials and all the physicians in the State.

Resolved further, That a copy of these resolutions be sent also to all the newspapers of the State, with special request to publish the same.

In making this appeal to the physicians and the press of the State, and to an intelligent public, it is hoped by the Board that even should any mild case of fever of a type transmissible by mosquitoes escape diagnosis, that being the greatest source of danger, the adoption of the simple precautions recommended in the resolutions may prevent further spread of the disease.

Newspapers receiving a copy of this are earnestly requested to publish same with suitable editorial comment.

Respectfully,

G. FARRAR PATTON, M. D., *Secretary.*

Approved:

EDMOND SOUCHON, M. D., *President.*